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## RAILWAY SIGNAL RELAY

### SERVICE MANUAL

This manual contains the Relay Inspection & Acceptance Procedure to be applied to the Railway Signal relay assets.

Issued under the authority of the Group Manager,  
Engineering Services, Public Transport  
Corporation.

Signed:.....*G. A. Moody*.....

Issued to:.....06.....



## Inspection & Acceptance Procedure

RS SC 0201

### Railway Signal Relays

*RHS*

## CONTENTS

SECTION ONE INTRODUCTION

SECTION TWO TERMINOLOGY

SECTION THREE SPECIFICATIONS AND STANDARDS

SECTION FOUR INDEX

SECTION FIVE INSPECTION & ACCEPTANCE INSTRUCTIONS



## **CONTENTS**

SECTION ONE INTRODUCTION

SECTION TWO TERMINOLOGY

SECTION THREE SPECIFICATIONS AND STANDARDS

SECTION FOUR INDEX

SECTION FIVE INSPECTION & ACCEPTANCE INSTRUCTIONS

**MANUAL CONFIGURATION CONTROL DATA**

<b>Section</b>	<b>Page Numbers</b>	<b>Issue Date</b>
Zero	i-iii	16 June 1994
One	1	16 June 1994
Two	2	16 June 1994
Three	3	16 June 1994
Four	4	16 June 1994
Five	6	26 April 1994 16 June 1994

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 0201</b>
	<b>Railway Signal Relays</b>	

## DOCUMENT DISTRIBUTION

<b>Position</b>	<b>Number of Copies</b>	<b>Copy Numbers</b>
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Manager, Country Signal Maintenance	1	5
Group Manager, MET Train	1	6

**SECTION ONE: INTRODUCTION**

1. This manual details the standard, for acceptance of rehabilitated Railway Signal Relays.
2. It is in the interest of all staff to ensure the safe operation of the rail system by not locally amending or deviating from these procedures. However, the right of all users to have an input to various elements of this manual is recognised and accordingly all are encouraged to identify perceived needs for change by forwarding proposals either in writing or verbally to Manager, Signalling Services.
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**SECTION TWO: TERMINOLOGY**

It is essential that the description content of inspection and acceptance procedures is correctly conveyed to and interpreted by all staff involved in their use. The following table provides a detailed description of the meaning of the key words used.

**Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

**Carbon Contacts**

A general term covering graphite, and compounds and mixtures carbon and metals.

**Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

**Compression Voltage**

That value of volts applied to the relay to compress the front contacts to the amount specified.

**Contact Types**

Front contact: that pair of contact components which close when a two position relay is energised.

Back contact: that pair of contact components which close when a two position relay is de-energised.

Normal contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminals having the same polarity markings are of the same polarity at any instant.

Reverse contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminals having opposite polarity markings are of same polarity at any instant

**Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.


**Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

**Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

LIGHT LIGHT COMPRESSION ?

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 0201</b>
	<b>Railway Signal Relays</b>	

### SECTION THREE: SPECIFICATIONS AND STANDARDS

The following is a list of specifications and standards utilised in the generation of these procedures. Copies of the the specifications are available for reference from the Manager, Signalling Services.

#### **Association of American Railroads Signal Manual**

AAR 6.1.35	1991
AAR 6.1.40	1991
AAR 6.4.5	1991
AAR 6.5.1	1991
AAR 7.1.4	1990

#### **British Standard**

BS 561:1951
BS 1745:1951

#### **Public Transport Corporation.**

Instruction VR 7	May 1945
LS SC 020102 - 01	April 1994

#### **Westing house Brake & Signal Co. (Aust.) Ltd.**

Spec. No. 18611	1940
Spec. No. 29610	1954
Spec. No. M2961.10	1988
Drg. AM16567	Rev2/1946
Drg. PS1107	Rev H





## SECTION FOUR:

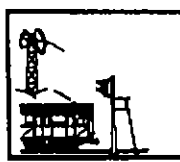

INDEX		
TYPE	SPECIFICATION No.	ISSUE DATE
<b><u>SHELF RELAY AC</u></b>		
V2SX 6-6 (25Hz)	RS SC 020101 - 01	26 April 1994
V2SX 6-6 (50Hz)	RS SC 020101 - 02	26 April 1994
V2D 6-2 (25Hz)	RS SC 020101 - 04	26 April 1994
V2D 6-6 (25Hz)	RS SC 020101 - 07	26 April 1994
V2D 6-6 (50Hz)	RS SC 020101 - 08	26 April 1994
V2D 10-2 (25Hz)	RS SC 020101 - 09	26 April 1994
V2D 10-2 (50Hz)	RS SC 020101 - 10	26 April 1994
V3D 6-6 (25Hz)	RS SC 020101 - 11	26 April 1994
V3D 6-6 (50Hz)	RS SC 020101 - 12	26 April 1994
V3D 8-4 (25Hz)	RS SC 020101 - 13	26 April 1994
V3D 8-4 (50Hz)	RS SC 020101 - 14	26 April 1994
V2T 6-2 (25Hz)	RS SC 020101 - 21	26 April 1994
V2T 6-2 (50Hz)	RS SC 020101 - 22	26 April 1994
V2T 10-2 (25Hz)	RS SC 020101 - 23	26 April 1994
V2T 10-2 (50Hz)	RS SC 020101 - 24	26 April 1994
<b><u>SHELF RELAY DC</u></b>		

**Acceptance Specification**

RS SC 0201

**Railway Signal Relays****INDEX**

TYPE	SPECIFICATION No.	ISSUE DATE
<b><u>LARGE PLUG-IN RELAY AC</u></b>		
VT1 2-2 (25Hz)	RS SC 020102 - 01	26 April 1994
VT1 2-2 (50Hz)	RS SC 020102 - 02	26 April 1994
VT1 4-2 (50Hz)	RS SC 020102 - 03	26 April 1994
VT1 8-4 (50Hz)	RS SC 020102 - 04	26 April 1994
<b><u>LARGE PLUG-IN RELAY DC</u></b>		
<b><u>SIGNAL RELAY SEARCHLIGHT AC</u></b>		
V3G 2-2-2 (25Hz) C5	RS SC 030107-01	7 September 1994
V3G 2-2-2 (50Hz) C5	RS SC 030107-02	7 September 1994
<b><u>SIGNAL RELAY SEARCHLIGHT DC</u></b>		

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-01</b>
	<b>Railway Signal Relay</b>	

## **V2SX 6-6 25Hz. AC Shelf Relay**

### **1. Insulation Resistance.**

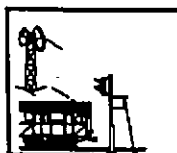
- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and slow drop away without hesitation or restriction with the rated voltage applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly. AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified. AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged. BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
     i. are fitted and clearly visible.  
     ii. have conforming performance figures & signature of tester. AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame. AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface. BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.1745:1951/9d

*RB***V2SX 6-6 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter.

AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

**3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.

BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.

BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots.

BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035".

VR 7May 1945

3.5 Check the Vane for the following :-

i. End play is between 0.010" and 0.015".

ii. Vane to Laminations clearances is between 0.017" and 0.027".

AAR.6.1.35/C5 1991

iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").

3.6 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Front Contacts)

:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 15gms all contacts.

AAR.6.1.35/E1 1991

3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open.

AAR.6.1.35/J6 1991

**V2SX 6-6 25Hz. AC Shelf Relay**

3.9 Check that when the spindle is held rigid, the clutch slips in either direction with a torque of 5-6 inch ounces on the pinion.

WB&amp;S Drg.AM16567 1946

3.10 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 7.5.

3.11 Operating Figures :-

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased.

BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage.

BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage.

BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure.

BS.1745:1951/9d

**Rated Voltage:-** 110 volts

**Slow Release Drop Away:-** With relay energised at rated voltage:

Power off - till first front contact opens, shall be not less than 0.6 second.

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-01
	<b>Railway Signal Relay</b>	<i>UB</i>

## **V2SX 6-6 25Hz. AC Shelf Relay**

### **4. Friction Test**

- 4.1 Apply voltage to the coil and gradually increase it until the first of the front contacts just closes, then gradually reduce the voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

### **5. Reduced Voltage Performance**

- 5.1 The voltage on the coil shall be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

*RHS***V2SX 6-6 25Hz. AC Shelf Relay****6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

**6.1 Pick Up Test**

Gradually increase the voltage on the coil until all front contacts just close.

**6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the coil until the front contacts reach compression.

**6.3 Drop Away Test**

Increase the applied voltage on the coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

**6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

**6.5 Bob-Test**

With rated voltage altered to 75% and then 125%, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed. (*rapidly or slowly?*)

**6.6 Lubrication**

The portion of vane shaft covered by the pinion is to be lubricated by a light dusting of powdered graphite.

WB&amp;S Drg. AM18567 1946

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-01
	<b>Railway Signal Relay</b>	

## **V2SX 6-6 25Hz. AC Shelf Relay**

### **7. Definitions.**

#### **7.1 Contact Types**

8.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

8.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

#### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

#### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

#### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

#### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

#### **7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

#### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-02</b>
	<b>Railway Signal Relay</b>	

## **V2SX 6-6 50Hz. AC Shelf Relay**

### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and slow drop away without hesitation or restriction with the rated voltage applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised.  
BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-02</b>
	<b>Railway Signal Relay</b>	

### **V2SX 6-6 50Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/H3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted yellow.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised. BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised. BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances is between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").

3.6 Check that contact resistances do not exceed :-

Silver - Silver carbon	:- 0.09 ohms (Front Contacts)	
	:- 0.18 ohms (Back Contacts)	AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991

3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991

**V2SX 6-6 50Hz. AC Shelf Relay**

- 3.9 Check that when the spindle is held rigid, the clutch slips in either direction with a torque of 5-6 inch ounces on the pinion.

WB&amp;S Drg.AM18567 1946

- 3.10 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 7.5.

- 3.11 Operating Figures :-

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased.

BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage.

BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage.

BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure.

BS.1745:1951/9d

**Rated Voltage:-** 110 volts

**Slow Release Drop Away:-** With relay energised at rated voltage:

Power off - till first front contact opens, shall be not less than 0.6 second.

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-02
	<b>Railway Signal Relay</b>	

### **V2SX 6-6 50Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Apply voltage to the coil and gradually increase it until the first of the front contacts just closes, then gradually reduce the voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Reduced Voltage Performance**

- 5.1 The voltage on the coil shall be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-02
	<b>Railway Signal Relay</b>	

### V2SX 6-6 50Hz. AC Shelf Relay

#### **6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **6.1 Pick Up Test**

Gradually increase the voltage on the coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **6.5 Bob-Test**

With rated voltage altered to 75% and then 125%, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

##### **6.6 Lubrication**

The portion of vane shaft covered by the pinion is to be lubricated by a light dusting of powdered graphite.

WB&S Drg.AM18567 1948

**V2SX 6-6 50Hz. AC Shelf Relay****7. Definitions.****7.1 Contact Types**

8.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

8.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

**7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

**7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

**7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

**7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

**7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

**7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.

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S&C Standards & Development

**V2D 6-2 25Hz. AC Shelf Relay****1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

**2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.

- 2.2 The vane is true and central in a clear gap in the motor core.

- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.

AAR.6.4.5/B6 1991

- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.

AAR.6.4.5/B9 1991

- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.

- 2.6 Relay covers are clean, clear and undamaged.

BS.1745:1951/3a

- 2.7 The correct labels match the contact & terminal configuration which:-

i. are fitted and clearly visible.

ii. have conforming performance figures & signature of tester.

AAR.6.4.5/B11 1991

- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.

AAR.6.1.35/F 1991

- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.

- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.

BS.1745:1951/9c

- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised.

BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-04</b>
	<b>Railway Signal Relay</b>	

### **V2D 6-2 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised. BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised. BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

- i. Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991



	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-04</b>
	<b>Railway Signal Relay</b>	<i>RB</i>

### **V2D 6-2 25Hz. AC Shelf Relay**

- 3.7 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 7.5.

#### **3.10 Operating Figures :-**

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%).

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

**V2D 6-2 25Hz. AC Shelf Relay****4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

**5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

**6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-04
	<b>Railway Signal Relay</b>	

### **V2D 6-2 25Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of +/- 5% from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-04</b>
	<b>Railway Signal Relay</b>	

## **V2D 6-2 25Hz. AC Shelf Relay**

### **8. Definitions.**

#### **8.1 Contact Types**

8.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

8.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

#### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

#### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

#### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

#### **8.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

#### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

#### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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**V2D 6-6 25Hz. AC Shelf Relay****1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

**2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-07
	<b>Railway Signal Relay</b>	

### **V2D 6-6 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter.

AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.

BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.

BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots.

BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035".

VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027".

AAR.6.1.35/C5 1991

- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").

- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

- i. Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-07</b>
	<b>Railway Signal Relay</b>	

### **V2D 6-6 25Hz. AC Shelf Relay**

- 3.7 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 7.5.

#### **3.10 Operating Figures :-**

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%).

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

**V2D 6-6 25Hz. AC Shelf Relay****4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

**5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:
- i. The points at which front and back contacts close.
  - ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

**6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991



	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-07
	<b>Railway Signal Relay</b>	

### **V2D 6-6 25Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

**V2D 6-6 25Hz. AC Shelf Relay****8. Definitions.****8.1 Contact Types**

8.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

8.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

**8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

**8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

**8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

**8.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

**8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

**8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.

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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-08
	<b>Railway Signal Relay</b>	

## **V2D 6-6 50Hz. AC Shelf Relay**

### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-08</b>
	<b>Railway Signal Relay</b>	

### **V2D 6-6 50Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter.  
AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted yellow.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.  
BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.  
BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots.  
BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035".  
VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027".  
AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

- i. Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-08
	<b>Railway Signal Relay</b>	

### **V2D 6-6 50Hz. AC Shelf Relay**

- 3.7 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 7.5.

#### 3.10 Operating Figures :-

**Pick Up Voltage:-** The value when all front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which all front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when all the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%).

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-08
	<b>Railway Signal Relay</b>	

### **V2D 6-6 50Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

#### **6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-08
	<b>Railway Signal Relay</b>	<i>248</i>

### **V2D 6-6 50Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-08</b>
	<b>Railway Signal Relay</b>	

### **V2D 6-6 50Hz. AC Shelf Relay**

#### **8. Definitions.**

##### **8.1 Contact Types**

8.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

8.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

##### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **8.5 Compression Voltage**


That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-09
	<b>Railway Signal Relay</b>	

### **V2D 10-2 25Hz. AC Shelf Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.

- 2.2 The vane is true and central in a clear gap in the motor core.

- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.

AAR.6.4.5/B6 1991

- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.

AAR.6.4.5/B9 1991

- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.

- 2.6 Relay covers are clean, clear and undamaged.

BS.1745:1951/3a

- 2.7 The correct labels match the contact & terminal configuration which:-

- i. are fitted and clearly visible.
- ii. have conforming performance figures & signature of tester.

AAR.6.4.5/B11 1991

- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.

AAR.6.1.35/F 1991

- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.

- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.

BS.1745:1951/9c

- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised.

BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-09</b>
	<b>Railway Signal Relay</b>	

### **V2D 10-2 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter.  
AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.  
BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.  
BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots.  
BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035".  
VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027".  
AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

- i. Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-09
	<b>Railway Signal Relay</b>	

### **V2D 10-2 25Hz. AC Shelf Relay**

- 3.7 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 7.5.

#### 3.10 Operating Figures :-

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%).

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-09
	<b>Railway Signal Relay</b>	<i>Pls</i>

### **V2D 10-2 25Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

#### **6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-09
	<b>Railway Signal Relay</b>	

### **V2D 10-2 25Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-09
	<b>Railway Signal Relay</b>	

### **V2D 10-2 25Hz. AC Shelf Relay**

#### **8. Definitions.**

##### **8.1 Contact Types**

8.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

8.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

##### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **8.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-10
	<b>Railway Signal Relay</b>	

## **V2D 10-2 50Hz. AC Shelf Relay**

### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly. AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified. AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged. BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
     i. are fitted and clearly visible.  
     ii. have conforming performance figures & signature of tester. AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame. AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface. BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-10
	<b>Railway Signal Relay</b>	

### **V2D 10-2 50Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted yellow.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised. BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised. BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.581:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

- i. Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991



	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-10</b>
	<b>Railway Signal Relay</b>	

### **V2D 10-2 50Hz. AC Shelf Relay**

- 3.7 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 7.5.

#### 3.10 Operating Figures :-

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%).

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-10
	<b>Railway Signal Relay</b>	

### **V2D 10-2 50Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:
- i. The points at which front and back contacts close.
  - ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

#### **6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-10
	<b>Railway Signal Relay</b>	<i>AKS</i>

### **V2D 10-2 50Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-10</b>
	<b>Railway Signal Relay</b>	

### **V2D 10-2 50Hz. AC Shelf Relay**

#### **8. Definitions.**

##### **8.1 Contact Types**

8.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

8.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

##### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **8.5 Compression Voltage**

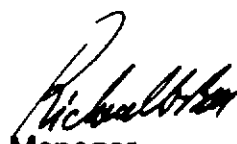
That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-11
	<b>Railway Signal Relay</b>	

### **V3D 6-6 25Hz. AC Shelf Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.561:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS561.:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.3/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.561:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage.  
BS.561:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-11
	<b>Railway Signal Relay</b>	

### **V3D 6-6 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

### **3. Mechanical Settings.**

3.1 Check that for both normal and reverse contacts opening is not less than 0.031" when the relay is de-energised. AAR.6.4.5/C7 1991

3.2 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.3 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.4 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Normal & Reverse Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 15gms all contacts.

AAR.6.1.35/E.1 1991

3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open.

AAR.6.1.35/J8 1991

3.9 Check that contacts do not "bounce" when the relay is energised as per the Bob-Test clause 7.5. BS.561:1951/9a

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-11
	<b>Railway Signal Relay</b>	

### **V3D 6-6 25Hz. AC Shelf Relay**

- 3.10 Check that there is no making of opposite contacts when the relay is de-energized during Bob-Test clause 7.5. BS.561:1951/9e

#### 3.11 Operating Figures :-

**Pick Up Voltage:-** The value when **all** normal or reverse contacts just close as voltage is gradually increased. BS.561:1951/20

**Drop Away Voltage:-** The value at which **all** normal or reverse contacts just open as the voltage is gradually decreased from the rated voltage. BS.561:1951/20

Check that as the voltage is reduced from compression, the voltage at which all the normal or reverse contacts just open is not less than 30% of the rated voltage. BS.561:1951/20

**Compression Voltage:-** The value when **all** the normal or reverse contacts have reached the specified minimum contact pressure. BS.561:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%). BS.561:1951/20

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

All tests shall be carried out for both normal & reverse polarities of the relay.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-11
	<b>Railway Signal Relay</b>	<i>RHB</i>

### **V3D 6-6 25Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the normal or reverse contacts just closes, then gradually reduce the control voltage until the contacts just opens. The voltage at which this contact just opens shall be not less than 85% of that required for its closure.

BS.561:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:
- i. The points at which normal and reverse contacts close.
  - ii. The points at which the specified contact pressure is obtained in the normal and reverse positions.

BS.561:1951/23

#### **6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.8.1.35/J5 1991



	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-11
	<b>Railway Signal Relay</b>	<i>RS</i>

### **V3D 6-6 25Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all normal or reverse contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the normal or reverse contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the normal or reverse contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed. Nor shall any of the "Opposite" contacts make during this test.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-11
	<b>Railway Signal Relay</b>	

### **V3D 6-6 25Hz. AC Shelf Relay**

#### **8. Definitions.**

##### **8.1 Contact Types**

8.1.1 Normal contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having the same polarity markings are of the same polarity at any instant.

8.1.2 Reverse contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having opposite polarity markings are of same polarity at any instant

##### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **8.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-12
	<b>Railway Signal Relay</b>	

### **V3D 6-6 50Hz. AC Shelf Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.  
BS.561:1951/19b  
 The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS561.:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
     i. are fitted and clearly visible.  
     ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.561:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage.  
BS.561:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-12
	<b>Railway Signal Relay</b>	

### **V3D 6-6 50Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted yellow.

### **3. Mechanical Settings.**

3.1 Check that for both normal and reverse contacts opening is not less than 0.031" when the relay is de-energised. AAR.6.4.5/C7 1991

3.2 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.3 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.4 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Normal & Reverse Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 15gms all contacts.

AAR.6.1.35/E.1 1991

3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open.

AAR.6.1.35/J6 1991

3.9 Check that contacts do not "bounce" when the relay is energised as per the Bob-Test clause 7.5. BS.561:1951/90

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-12
	<b>Railway Signal Relay</b>	

### **V3D 6-6 50Hz. AC Shelf Relay**

- 3.10 Check that there is no making of opposite contacts when the relay is de-energized during Bob-Test clause 7.5. BS.561:1951/9e

3.11 Operating Figures :-

**Pick Up Voltage:-** The value when **all** normal or reverse contacts just close as voltage is gradually increased. BS.561:1951/20

**Drop Away Voltage:-** The value at which **all** normal or reverse contacts just open as the voltage is gradually decreased from the rated voltage. BS.561:1951/20

Check that as the voltage is reduced from compression, the voltage at which all the normal or reverse contacts just open is not less than 30% of the rated voltage. BS.561:1951/20

**Compression Voltage:-** The value when **all** the normal or reverse contacts have reached the specified minimum contact pressure. BS.561:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%). BS.561:1951/20

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

All tests shall be carried out for both normal & reverse polarities of the relay.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-12
	<b>Railway Signal Relay</b>	

### **V3D 6-6 50Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the normal or reverse contacts just closes, then gradually reduce the control voltage until the contacts just opens. The voltage at which this contact just opens shall be not less than 85% of that required for its closure.

BS.561:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:
- i. The points at which normal and reverse contacts close.
  - ii. The points at which the specified contact pressure is obtained in the normal and reverse positions.

BS.561:1951/23

#### **6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-12
	<b>Railway Signal Relay</b>	

### **V3D 6-6 50Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all normal or reverse contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the normal or reverse contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the normal or reverse contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed. Nor shall any of the "Opposite" contacts make during this test.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-12
	<b>Railway Signal Relay</b>	

### **V3D 6-6 50Hz. AC Shelf Relay**

#### **8. Definitions.**

##### **8.1 Contact Types**

8.1.1 Normal contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having the same polarity markings are of the same polarity at any instant.

8.1.2 Reverse contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having opposite polarity markings are of same polarity at any instant

##### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **8.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-13
	<b>Railway Signal Relay</b>	

### **V3D 8-4 25Hz. AC Shelf Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.561:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS561.:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.561:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage.  
BS.561:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-13
	<b>Railway Signal Relay</b>	<i>RHS</i>

### **V3D 8-4 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

### **3. Mechanical Settings.**

3.1 Check that for both normal and reverse contacts opening is not less than 0.031" when the relay is de-energised. AAR.6.4.5/C7 1991

3.2 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.3 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.4 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Normal & Reverse Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 15gms all contacts.

AAR.6.1.35/E.1 1991

3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open.

AAR.6.1.35/J6 1991

3.9 Check that contacts do not "bounce" when the relay is energised as per the Bob-Test clause 7.5. BS.561:1951/9a

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-13
	<b>Railway Signal Relay</b>	

### **V3D 8-4 25Hz. AC Shelf Relay**

- 3.10 Check that there is no making of opposite contacts when the relay is de-energized during Bob-Test clause 7.5. BS.561:1951/9e

3.11 Operating Figures :-

**Pick Up Voltage:-** The value when **all** normal or reverse contacts just close as voltage is gradually increased. BS.561:1951/20

**Drop Away Voltage:-** The value at which **all** normal or reverse contacts just open as the voltage is gradually decreased from the rated voltage. BS.561:1951/20

Check that as the voltage is reduced from compression, the voltage at which all the normal or reverse contacts just open is not less than 30% of the rated voltage. BS.561:1951/20

**Compression Voltage:-** The value when **all** the normal or reverse contacts have reached the specified minimum contact pressure. BS.561:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%). BS.561:1951/20

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

All tests shall be carried out for both normal & reverse polarities of the relay.

**V3D 8-4 25Hz. AC Shelf Relay****4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the normal or reverse contacts just closes, then gradually reduce the control voltage until the contacts just opens. The voltage at which this contact just opens shall be not less than 85% of that required for its closure.

BS.561:1951/20

**5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which normal and reverse contacts close.
- ii. The points at which the specified contact pressure is obtained in the normal and reverse positions.

BS.561:1951/23

**6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-13
	<b>Railway Signal Relay</b>	<i>RM</i>

### **V3D 8-4 25Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all normal or reverse contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the normal or reverse contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the normal or reverse contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed. Nor shall any of the "Opposite" contacts make during this test.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-13
	<b>Railway Signal Relay</b>	

### **V3D 8-4 25Hz. AC Shelf Relay**

#### **8. Definitions.**

##### **8.1 Contact Types**

8.1.1 Normal contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having the same polarity markings are of the same polarity at any instant.

8.1.2 Reverse contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having opposite polarity markings are of same polarity at any instant

##### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **8.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-14
	<b>Railway Signal Relay</b>	

### **V3D 8-4 50Hz. AC Shelf Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.561:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS561:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.561:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage.  
BS.561:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-14
	<b>Railway Signal Relay</b>	

### **V3D 8-4 50Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted yellow.

### **3. Mechanical Settings.**

3.1 Check that for both normal and reverse contacts opening is not less than 0.031" when the relay is de-energised. AAR.6.4.5/C7 1991

3.2 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.3 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.4 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.6 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Normal & Reverse Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 15gms all contacts.

AAR.6.1.35/E.1 1991

3.8 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991

3.9 Check that contacts do not "bounce" when the relay is energised as per the Bob-Test clause 7.5. BS.561:1951/9



	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-14
	<b>Railway Signal Relay</b>	<i>RB</i>

### **V3D 8-4 50Hz. AC Shelf Relay**

- 3.10 Check that there is no making of opposite contacts when the relay is de-energized during Bob-Test clause 7.5. BS.561:1951/9e

3.11 Operating Figures :-

**Pick Up Voltage:-** The value when **all** normal or reverse contacts just close as voltage is gradually increased. BS.561:1951/20

**Drop Away Voltage:-** The value at which **all** normal or reverse contacts just open as the voltage is gradually decreased from the rated voltage. BS.561:1951/20

Check that as the voltage is reduced from compression, the voltage at which all the normal or reverse contacts just open is not less than 30% of the rated voltage. BS.561:1951/20

**Compression Voltage:-** The value when **all** the normal or reverse contacts have reached the specified minimum contact pressure. BS.561:1951/9d

**Rated Voltage:-** 110 volts

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%). BS.561:1951/20

The tests shall be performed in accordance with clauses 7.1, 7.2 & 7.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

All tests shall be carried out for both normal & reverse polarities of the relay.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-14
	<b>Railway Signal Relay</b>	<i>RS</i>

### **V3D 8-4 50Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the normal or reverse contacts just closes, then gradually reduce the control voltage until the contacts just opens. The voltage at which this contact just opens shall be not less than 85% of that required for its closure.

BS.561:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:
- i. The points at which normal and reverse contacts close.
  - ii. The points at which the specified contact pressure is obtained in the normal and reverse positions.

BS.561:1951/23

#### **6. Reduced Voltage Performance**

- 6.1 The voltages on both Local & Control shall then be reduced to 93.5V (85% of 110V) and the relay shall be checked for full compression of its front contacts when energised under these conditions.

AAR.6.1.35/J5 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-14
	<b>Railway Signal Relay</b>	<i>RHS</i>

### **V3D 8-4 50Hz. AC Shelf Relay**

#### **7. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **7.1 Pick Up Test**

Gradually increase the voltage on the control coil until all normal or reverse contacts just close.

##### **7.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the normal or reverse contacts reach compression.

##### **7.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the normal or reverse contacts open.

##### **7.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **7.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed. Nor shall any of the "Opposite" contacts make during this test.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-14
	<b>Railway Signal Relay</b>	

### **V3D 8-4 50Hz. AC Shelf Relay**

#### **8. Definitions.**

##### **8.1 Contact Types**

8.1.1 Normal contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having the same polarity markings are of the same polarity at any instant.

8.1.2 Reverse contact: that pair of contact components which close when a three position relay is so energised that both local and control element terminal having opposite polarity markings are of same polarity at any instant

##### **8.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **8.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **8.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **8.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **8.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **8.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.

  
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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-21
	<b>Railway Signal Relay</b>	

### **V2T 6-2 25Hz. AC Shelf Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-21
	<b>Railway Signal Relay</b>	

### **V2T 6-2 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter.  
AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.  
BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.  
BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots.  
BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035".  
VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances is between 0.017" and 0.027".  
AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a toque of 16 inch pounds.

3.7 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-21
	<b>Railway Signal Relay</b>	

### **V2T 6-2 25Hz. AC Shelf Relay**

- 3.8 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.9 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.10 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

#### 3.11 Operating Figures :-

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall **not** exceed 0.70V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values. BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-21
	<b>Railway Signal Relay</b>	

### **V2T 6-2 25Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:
- i. The points at which front and back contacts close.
  - ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23



	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-21
	<b>Railway Signal Relay</b>	

### **V2T 6-2 25Hz. AC Shelf Relay**

#### **6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020101-21</b>
	<b>Railway Signal Relay</b>	

### **V2T 6-2 25Hz. AC Shelf Relay**

#### **7. Definitions.**

##### **7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

##### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-22
	<b>Railway Signal Relay</b>	

## **V2T 6-2 50Hz. AC Shelf Relay**

### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged.  
BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.  
AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.1745:1951/9d

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-22
	<b>Railway Signal Relay</b>	

### **V2T 6-2 50Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted yellow.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised. BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised. BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances is between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.7 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-22
	<b>Railway Signal Relay</b>	<i>RMS</i>

### V2T 6-2 50Hz. AC Shelf Relay

- 3.8 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.9 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.10 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

#### 3.11 Operating Figures :-

**Pick Up Voltage:-** The value when all front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which all front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when all the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d


**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall **not** exceed 0.50V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values. BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-22
	<b>Railway Signal Relay</b>	<i>Pub</i>

### **V2T 6-2 50Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-22
	<b>Railway Signal Relay</b>	

### **V2T 6-2 50Hz. AC Shelf Relay**

#### **6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-22
	<b>Railway Signal Relay</b>	

### **V2T 6-2 50Hz. AC Shelf Relay**

#### **7. Definitions.**

##### **7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

##### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-23
	<b>Railway Signal Relay</b>	<i>RHS</i>

## **V2T 10-2 25Hz. AC Shelf Relay**

### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.

- 2.2 The vane is true and central in a clear gap in the motor core.

- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly.

AAR.6.4.5/B6 1991

- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.

AAR.6.4.5/B9 1991

- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.

- 2.6 Relay covers are clean, clear and undamaged.

BS.1745:1951/3a

- 2.7 The correct labels match the contact & terminal configuration which:-

- i. are fitted and clearly visible.
- ii. have conforming performance figures & signature of tester.

AAR.6.4.5/B11 1991

- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame.

AAR.6.1.35/F 1991

- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.

- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.

BS.1745:1951/9c

- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised.

BS.1745:1951/9d

**V2T 10-2 25Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter.

AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted black.

**3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.

BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.

BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots.

BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035".

VR 7May 1945

3.5 Check the Vane for the following :-

i. End play is between 0.010" and 0.015".

ii. Vane to Laminations clearances is between 0.017" and 0.027".

AAR.6.1.35/C5 1991

iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").

iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.7 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Front Contacts)

:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-23
	<b>Railway Signal Relay</b>	<i>RHS</i>

### **V2T 10-2 25Hz. AC Shelf Relay**

- 3.8 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.9 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.10 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

#### 3.11 Operating Figures :-

**Pick Up Voltage:-** The value when all front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which all front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when all the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall **not** exceed 0.90V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values. BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-23
	<b>Railway Signal Relay</b>	

### **V2T 10-2 25Hz. AC Shelf Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

**V2T 10-2 25Hz. AC Shelf Relay****6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

**6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

**6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

**6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

**6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

**6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

**V2T 10-2 25Hz. AC Shelf Relay****7. Definitions.****7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

**7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

**7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

**7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

**7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

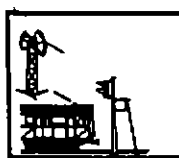
**7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

**7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.

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**V2T 10-2 50Hz. AC Shelf Relay****1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

**2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals are tight and locking tabs are intact and fitted correctly. AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified. AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.
- 2.6 Relay covers are clean, clear and undamaged. BS.1745:1951/3a
- 2.7 The correct labels match the contact & terminal configuration which:-  
i. are fitted and clearly visible.  
ii. have conforming performance figures & signature of tester. AAR.6.4.5/B11 1991
- 2.8 The flexes are not stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame. AAR.6.1.35/F 1991
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface. BS.1745:1951/9c
- 2.11 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.1745:1951/9d

*4/5***V2T 10-2 50Hz. AC Shelf Relay**

2.12 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991

2.13 That the correct plug top coding plate is affixed to the top of the relay.

2.14 The coils and magnetic circuit are painted yellow.

**3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised. BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised. BS.1745:1951/11

3.3 Check that the Operating Arm/Contact Carrier and Vane bearings are not less than 0.002" and not greater than 0.008" larger in diameter than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.4 Check that the end play of the Operating Arm/Contact Carrier is between 0.030" and 0.035". VR 7May 1945

3.5 Check the Vane for the following :-

- i. End play is between 0.010" and 0.015".
- ii. Vane to Laminations clearances is between 0.017" and 0.027". AAR.6.1.35/C5 1991
- iii. Air gap between Laminations faces shall be between 0.090" and 0.095" for vane thickness of 0.040". (Where vane thickness is other than 0.040", then the air gap shall be not less than a value equal to the vane thickness plus 0.050" or more than vane thickness plus 0.055").
- iv. Counter weights shall be locked together with a torque of 16 inch pounds.

3.7 Check that contact resistances do not exceed :-

Silver - Silver carbon :- 0.09 ohms (Front Contacts)  
:- 0.18 ohms (Back Contacts)

AAR.6.4.5/C9 1991



*AKB***V2T 10-2 50Hz. AC Shelf Relay**

- 3.8 Minimum Contact Pressure :- 15gms all contacts. AAR.6.1.35/E1 1991
- 3.9 Check that the mechanism develops a total gravity bias of not less than 57gms, measured at the front contacts and with the front contacts just open. AAR.6.1.35/J6 1991
- 3.10 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

**3.11 Operating Figures :-**

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall **not** exceed 0.70V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values. BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. **CONTROL** -ve.
- ii. +ve. **LOCAL** -ve.

**V2T 10-2 50Hz. AC Shelf Relay****4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

**5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

*RS***V2T 10-2 50Hz. AC Shelf Relay****6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

**6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

**6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

**6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

**6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

**6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020101-24
	<b>Railway Signal Relay</b>	

## **V2T 10-2 50Hz. AC Shelf Relay**

### **7. Definitions.**

#### **7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

#### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

#### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

#### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

#### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

#### **7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

#### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-01</b>
	<b>Railway Signal Relay</b>	

### **VT1 2-2 25Hz. AC Plug-In Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals for tightness and locking are tabs intact and fitted correctly. AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified. AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc. AAR.6.4.1/B3 1991
- 2.6 Relay covers are clean, clear and undamaged. BS.1745:1951/3a
- 2.7 The correct label:-  
i. is fitted and clearly visible.  
ii. has conforming performance figures & signature of tester. AAR.6.4.5/B11 1991
- 2.8 The coil flexes are clear of moving parts.
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface. AAR.6.4.5/C5 1991
- 2.11 The travel of the contact carrier, from point of pick up to compression shall be not less than 0.031" when the relay is energised. AAR.6.4.5/D1b 1991
- 2.12 Operating arm and link pin are free from wear and move freely with vane in any position. WBS.Spec.29610/pg 5 1954

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-01</b>
	<b>Railway Signal Relay</b>	

### **VT1 2-2 25Hz. AC Plug-In Relay**

2.13 Operating arm pins and pivots have received a trace of oil LS SC 020102 - 01.  
WBS.Spec.2961/pg 9 I,m 1954

2.14 The correct coding is affixed to the relay.

2.15 The coils and magnetic circuit are painted black.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.  
BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.  
BS.1745:1951/11

3.3 Check the Vane for the following :-

Bearings shall be not less than 0.002" or more than 0.004" in diameter than the pivots.  
AAR.6.5.1/C9,10 1991

- i. End play is between 0.010" and 0.015". WBS.Spec.29610/pg5 1954
- ii. Vane to Laminations clearances between 0.020" and 0.025".
- iii. Air gap between Laminations faces shall be between 0.078" and 0.085" for vane thickness of 0.034" - 0.038". (Where vane thickness is other than specified, then the air gap shall be not less than a value equal to the vane thickness plus 0.040" or more than vane thickness plus 0.045"). WBS.Spec.29610/pg5 1954
- iv. Counter weights shall be locked together with a torque of 16 inch pounds

3.6 Check that contact resistances do not exceed :-

- i. Metal - Carbon :- 0.09 ohms (Front Contacts)
- Metal - Metal :- 0.06 ohms (Back Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 21gms all contacts.

WBS.Spec.29610/pg 5,9 1954

3.8 Check that the vane exerts a return torque of 40gms centimetres, measured at the vane as the front contacts just open.  
WBS.Spec.29610/pg 6j 1954

3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-01</b>
	<b>Railway Signal Relay</b>	

### **VT1 2-2 25Hz. AC Plug-In Relay**

#### **3.10 Operating Figures :-**

**Pick Up Voltage:-** The value when all front contacts just close as the voltage is gradually increased. BS.1745:1951/20

**Drop Away Voltage:-** The value at which all front contacts just open as the voltage is gradually decreased from the rated voltage. BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.1745:1951/20

**Compression Voltage:-** The value when all the front contacts have reached the specified minimum contact pressure. BS.1745:1951/9d

**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall not exceed 0.55V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values. BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. R1 CONTROL R2 -ve.
- ii. +ve. Q1 LOCAL Q2 -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-01</b>
	<b>Railway Signal Relay</b>	

### **VT1 2-2 25Hz. AC Plug-In Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23



	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020102-01
	<b>Railway Signal Relay</b>	<i>RHB</i>

### **VT1 2-2 25Hz. AC Plug-in Relay**

#### **6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-01</b>
	<b>Railway Signal Relay</b>	

### **VT1 2-2 25Hz. AC Plug-In Relay**

#### **7. Definitions.**

##### **7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

##### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020102-02
	<b>Railway Signal Relay</b>	

## **VT1 2-2 50Hz. AC Plug-In Relay**

### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals for tightness and locking are tabs intact and fitted correctly. AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified. AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc. AAR.6.4.1/B3 1991
- 2.6 Relay covers are clean, clear and undamaged. BS.1745:1951/3a
- 2.7 The correct label:-  
     i. is fitted and clearly visible.  
     ii. has conforming performance figures & signature of tester. AAR.6.4.5/B11 1991
- 2.8 The coil flexes are clear of moving parts.
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface. AAR.6.4.5/C5 1991
- 2.11 The travel of the contact carrier, from point of pick up to compression shall be not less than 0.031" when the relay is energised. AAR.6.4.5/D1b 1991
- 2.12 Operating arm and link pin are free from wear and move freely with vane in any position. WBS.Spec.29610/pg 6 1954

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020102-02
	<b>Railway Signal Relay</b>	

### **VT1 2-2 50Hz. AC Plug-In Relay**

2.13 Operating arm pins and pivots have received a trace of oil LS SC 020102 - 01.  
WBS.Spec.2961/pg 9 l,m 1954

2.14 The correct coding is affixed to the relay.

2.15 The coils and magnetic circuit are painted yellow.

### **3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised.  
BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised.  
BS.1745:1951/11

3.3 Check the Vane for the following :-

Bearings shall be not less than 0.002" or more than 0.004" in diameter than the pivots.  
AAR.6.5.1/C9,10 1991

- i. End play is between 0.010" and 0.015". WBS.Spec.29610/pg5 1954
- ii. Vane to Laminations clearances between 0.020" and 0.025".
- iii. Air gap between Laminations faces shall be between 0.078" and 0.085" for vane thickness of 0.034" - 0.038". (Where vane thickness is other than specified, then the air gap shall be not less than a value equal to the vane thickness plus 0.040" or more than vane thickness plus 0.045"). WBS.Spec.29610/pg5 1954
- iv. Counter weights shall be locked together with a torque of 16 inch pounds

3.6 Check that contact resistances do not exceed :-

- i. Metal - Carbon :- 0.09 ohms (Front Contacts)
- Metal - Metal :- 0.06 ohms (Back Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 21gms all contacts. WBS.Spec.29610/pg 8,9 1954

3.8 Check that the vane exerts a return torque of 40gms centimetres, measured at the vane as the front contacts just open.  
WBS.Spec.29610/pg 8j 1954

3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-02</b>
	<b>Railway Signal Relay</b>	<i>21/3</i>

### **VT1 2-2 50Hz. AC Plug-In Relay**

#### **3.10 Operating Figures :-**

**Pick Up Voltage:-** The value when all front contacts just close as the voltage is gradually increased.

BS.1745:1951/20

**Drop Away Voltage:-** The value at which all front contacts just open as the voltage is gradually decreased from the rated voltage.

BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage.

BS.1745:1951/20

**Compression Voltage:-** The value when all the front contacts have reached the specified minimum contact pressure.

BS.1745:1951/9d

**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall **not** exceed 0.52V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values.

BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. R1 CONTROL R2 -ve.
- ii. +ve. Q1 LOCAL Q2 -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-02</b>
	<b>Railway Signal Relay</b>	

### **VT1 2-2 50Hz. AC Plug-In Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020102-02
	<b>Railway Signal Relay</b>	

### **VT1 2-2 50Hz. AC Plug-In Relay**

#### **6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-02</b>
	<b>Railway Signal Relay</b>	

## **VT1 2-2 50Hz. AC Plug-In Relay**

### **7. Definitions.**

#### **7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

#### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

#### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

#### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

#### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

#### **7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

#### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-03</b>
	<b>Railway Signal Relay</b>	

### **VT1 4-2 50Hz. AC Plug-in Relay**

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

#### **2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals for tightness and locking are tabs intact and fitted correctly.  
AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified.  
AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc.  
AAR.6.4.1/B3 1991
- 2.6 Relay covers are clean, clear and undamaged.  
BS.1745:1951/3a
- 2.7 The correct label:-  
i. is fitted and clearly visible.  
ii. has conforming performance figures & signature of tester.  
AAR.6.4.5/B11 1991
- 2.8 The coil flexes are clear of moving parts.
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface.  
AAR.6.4.5/C5 1991
- 2.11 The travel of the contact carrier, from point of pick up to compression shall be not less than 0.031" when the relay is energised.  
AAR.6.4.5/D1b 1991
- 2.12 Operating arm and link pin are free from wear and move freely with vane in any position.  
WBS.Spec.29610/pg 5 1954

**VT1 4-2 50Hz. AC Plug-In Relay**

2.13 Operating arm pins and pivots have received a trace of oil LS SC 020102 - 01. WBS.Spec.2961/pg 9 I,m 1954

2.14 The correct coding is affixed to the relay.

2.15 The coils and magnetic circuit are painted yellow.

**3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised. BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised. BS.1745:1951/11

3.3 Check the Vane for the following :-

Bearings shall be not less than 0.002" or more than 0.004" in diameter than the pivots. AAR.6.5.1/C9,10 1991

- i. End play is between 0.010" and 0.015". WBS.Spec.29610/pg5 1954
- ii. Vane to Laminations clearances between 0.020" and 0.025".
- iii. Air gap between Laminations faces shall be between 0.078" and 0.085" for vane thickness of 0.034" - 0.038". (Where vane thickness is other than specified, then the air gap shall be not less than a value equal to the vane thickness plus 0.040" or more than vane thickness plus 0.045"). WBS.Spec.29810/pg5 1954
- iv. Counter weights shall be locked together with a torque of 16 inch pounds

3.6 Check that contact resistances do not exceed :-

- i. Metal - Carbon :- 0.09 ohms (Front Contacts)  
Metal - Metal :- 0.06 ohms (Back Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 21gms all contacts. WBS.Spec.29610/pg 8,9 1954

3.8 Check that the vane exerts a return torque of 40gms centimetres, measured at the vane as the front contacts just open. WBS.Spec.29610/pg 8J 1954

3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-03</b>
	<b>Railway Signal Relay</b>	

### **VT1 4-2 50Hz. AC Plug-In Relay**

#### **3.10 Operating Figures :-**

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased.

BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage.

BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage.

BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure.

BS.1745:1951/9d

**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall **not** exceed 0.65V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values.

BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. R1 **CONTROL** R2 -ve.
- ii. +ve. Q1 **LOCAL** Q2 -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-03</b>
	<b>Railway Signal Relay</b>	<i>RHS</i>

### **VT1 4-2 50Hz. AC Plug-In Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020102-03
	<b>Railway Signal Relay</b>	

### **VT1 4-2 50Hz. AC Plug-In Relay**

#### **6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020102-03
	<b>Railway Signal Relay</b>	

### **VT1 4-2 50Hz. AC Plug-In Relay**

#### **7. Definitions.**

##### **7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

##### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

##### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

##### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

##### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

##### **7.6 Rated Voltage**

That nominal value of volts intended to be applied to the relay in service operation.

##### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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**VT1 8-4 50Hz. AC Plug-In Relay****1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

BS.1745:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts.

**2. Mechanical Inspection. - Remove the Relay Seals and check that :-**

- 2.1 By observation the relay has positive pick up and drop away without hesitation or restriction with the rated voltages applied.
- 2.2 The vane is true and central in a clear gap in the motor core.
- 2.3 All screws, nuts and terminals for tightness and locking are tabs intact and fitted correctly. AAR.6.4.5/B6 1991
- 2.4 There is a minimum 0.125" clearance between all moving and fixed parts from case cover unless otherwise specified. AAR.6.4.5/B9 1991
- 2.5 The gaskets are intact, sealed properly and are free from dust, fluff etc. AAR.6.4.1/B3 1991
- 2.6 Relay covers are clean, clear and undamaged. BS.1745:1951/3a
- 2.7 The correct label:-  
i. is fitted and clearly visible.  
ii. has conforming performance figures & signature of tester. AAR.6.4.5/B11 1991
- 2.8 The coil flexes are clear of moving parts.
- 2.9 The contacts are approximately 75% light tight on compression. The contact fingers shall meet the fixed contact surface uniformly.
- 2.10 The metal holder of the silver carbon contact is not within 0.060" (1/16") of the contact surface. AAR.6.4.5/C5 1991
- 2.11 The travel of the contact carrier, from point of pick up to compression shall be not less than 0.031" when the relay is energised. AAR.6.4.5/D1b 1991
- 2.12 Operating arm and link pin are free from wear and move freely with vane in any position. WBS.Spec.29610/pg 5 1954

**VT1 8-4 50Hz. AC Plug-In Relay**

2.13 Operating arm pins and pivots have received a trace of oil LS SC 020102 - 01. WBS.Spec.2961/pg 9 l,m 1954

2.14 The correct coding is affixed to the relay.

2.15 The coils and magnetic circuit are painted yellow.

**3. Mechanical Settings.**

3.1 Check that the front contact opening is not less than 0.030" when the back contacts are just made, and not less than 0.060" when the relay is de-energised. BS.1745:1951/11

3.2 Check that the back contact opening is not less than 0.030" when front contacts just make and not less than 0.060" when the relay is fully energised. BS.1745:1951/11

3.3 Check the Vane for the following :-

Bearings shall be not less than 0.002" or more than 0.004" in diameter than the pivots. AAR.6.5.1/C9,10 1991

- i. End play is between 0.010" and 0.015". WBS.Spec.29610/pg5 1954
- ii. Vane to Laminations clearances between 0.020" and 0.025".
- iii. Air gap between Laminations faces shall be between 0.078" and 0.085" for vane thickness of 0.034" - 0.038". (Where vane thickness is other than specified, then the air gap shall be not less than a value equal to the vane thickness plus 0.040" or more than vane thickness plus 0.045"). WBS.Spec.29610/pg5 1954
- iv. Counter weights shall be locked together with a torque of 16 inch pounds

3.6 Check that contact resistances do not exceed :-

- i. Metal - Carbon :- 0.09 ohms (Front Contacts)
- Metal - Metal :- 0.06 ohms (Back Contacts)

AAR.6.4.5/C9 1991

3.7 Minimum Contact Pressure :- 21gms all contacts.

WBS.Spec.29610/pg 8,9 1954

3.8 Check that the vane exerts a return torque of 40gms centimetres, measured at the vane as the front contacts just open.

WBS.Spec.29610/pg 8J 1954

3.9 Check that back contacts do not "bounce" open when the relay drops as per the Bob-Test clause 6.5.



*RS***VT1 8-4 50Hz. AC Plug-In Relay****3.10 Operating Figures :-**

**Pick Up Voltage:-** The value when **all** front contacts just close as the voltage is gradually increased.

BS.1745:1951/20

**Drop Away Voltage:-** The value at which **all** front contacts just open as the voltage is gradually decreased from the rated voltage.

BS.1745:1951/20

Check that as the voltage is reduced from compression, the voltage at which all back contacts just close is both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage.

BS.1745:1951/20

**Compression Voltage:-** The value when **all** the front contacts have reached the specified minimum contact pressure.

BS.1745:1951/9d

**Rated Voltage:-** The value at which compression is completed plus 0.10 volt.  
(This voltage shall **not** exceed 0.90V)

These figures shall be achieved with the local coil energised at 110VAC (+/- 1%) and with a 90deg. phase angle between Control and Local voltages. If the 90deg. is unattainable then the test results shall be corrected to the ideal quadrature values.

BS.1745:1951/20

The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document.

Check for the following Polarity connections :-

- i. +ve. R1 CONTROL R2 -ve.
- ii. +ve. Q1 LOCAL Q2 -ve.

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-04</b>
	<b>Railway Signal Relay</b>	

### **VT1 8-4 50Hz. AC Plug-In Relay**

#### **4. Friction Test**

- 4.1 Set the local voltage as above and apply the control voltage gradually increasing it until the first of the front contacts just closes, then gradually reduce the control voltage until the front contact just opens. The voltage at which this contact just opens shall be not less than 90% of that required for its closure.

BS.1745:1951/20

#### **5. Pointer Scale**

- 5.1 Check that the markings on the pointer scale indicate the following:

- i. The points at which front and back contacts close.
- ii. The points at which the specified contact pressure is obtained on all contacts.

BS.1745:1951/23

	<b>Inspection &amp; Acceptance Procedure</b>	<b>RS SC 020102-04</b>
	<b>Railway Signal Relay</b>	

### **VT1 8-4 50Hz. AC Plug-In Relay**

#### **6. General Information.**

Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open.

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage.

##### **6.5 Bob-Test**

With rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

	<b>Inspection &amp; Acceptance Procedure</b>	RS SC 020102-04
	<b>Railway Signal Relay</b>	

## **VT1 8-4 50Hz. AC Plug-In Relay**

### **7. Definitions.**

#### **7.1 Contact Types**

7.1.1 Front contact: that pair of contact components which close when a two position relay is energised.

7.1.2 Back contact: that pair of contact components which close when a two position relay is de-energised.

#### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

#### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

#### **7.4 Pick Up Voltage**

That value of volts applied to the relay which will just cause all front contacts to make electrical contact.

#### **7.5 Compression Voltage**

That value of volts applied to the relay which will compress the front contacts to the amount specified.

#### **7.6 Rated Voltage**

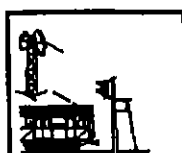

That nominal value of volts intended to be applied to the relay in service operation.

#### **7.7 Drop Away Voltage**

That value of volts at which all front contacts cease to make electrical connection.



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	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	

## **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

This document details the minimum acceptance performance requirements following rehabilitation of a Westinghouse Brake & Signal V3G 2-2-2 (C5) 25Hz Railway Searchlight Signal Relay.

### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

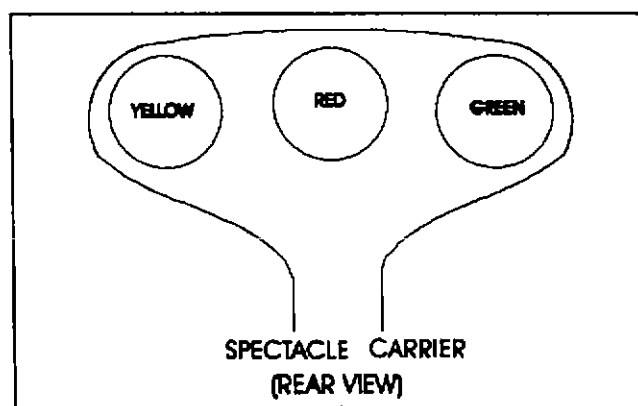
BS.561:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts DC.



### **2. Mechanical Inspection.**

#### **2.1 Case**

- 2.1.1 The roundel glasses must be clean and intact.
- 2.1.2 The roundel case must be properly fixed to the top plate.
- 2.1.3 The carrying handle must be tight.
- 2.1.4 The gaskets must be intact, seal properly and be free from dust and moisture.
- 2.1.5 Relay cover must be clean, clear and undamaged. BS.561:1951/3a
- 2.1.6 Top plate plug contact terminal pins shall be to the desired shape (see top plate coding figure 2) and their surrounds shall be properly sealed.
- 2.1.7 The correct colour roundels must be fitted to the spectacle (see diagram).

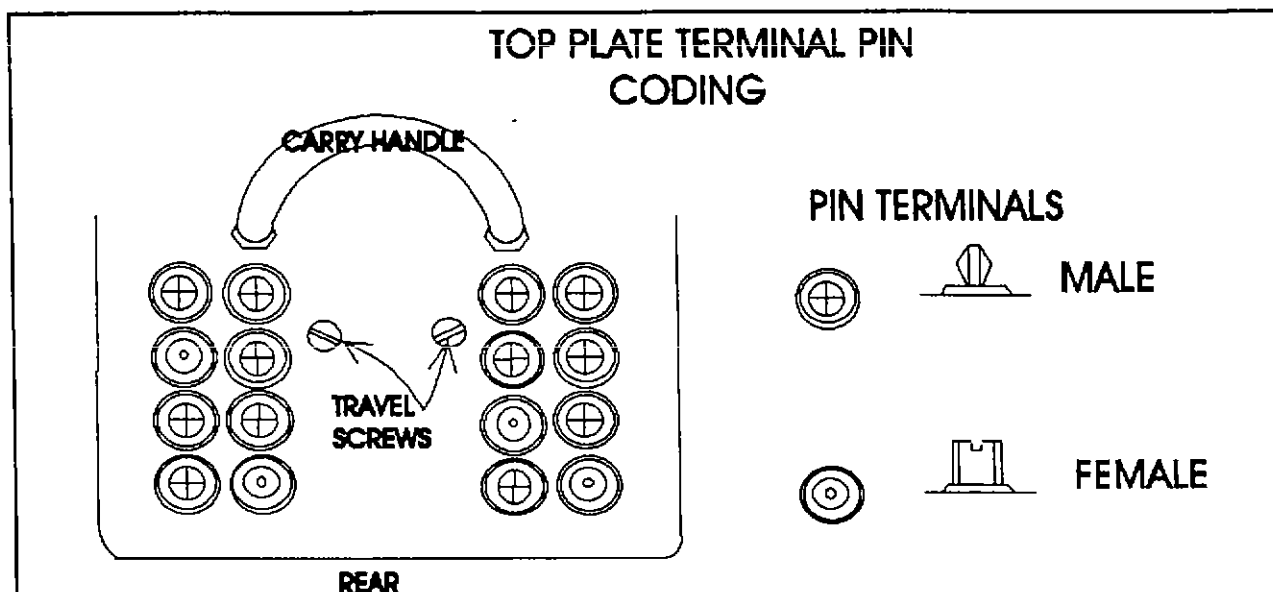


**Spectacle Arrangement (figure 1).**

	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

- 2.1.8 All screws, nuts and terminals are tight and locking tabs must be intact and fitted correctly. AAR.6.4.5/B6 1991
- 2.1.9 There must be at least 0.125" clearance between all moving parts and fixed parts and/or cover unless otherwise specified. AAR.6.4.5/B9 1991



Top Plate Plug Coding (figure 2).

- 2.1.10 The correct terminal pin coding must be affixed to the top of the relay for each plug (see diagram).
- 2.1.11 The following labels shall be fitted and clearly visible.:
- i. Relay contact arrangement label 15B1150.
  - ii. The Corporation's identification label which shall have conforming performance figurers & signature of tester.


AAR.6.4.5/B11 1991

	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	<i>PHB</i>

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

#### **2.2 Mechanism**

- 2.2.1 Pivots and bearings must be clean and dry.
- 2.2.2 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991.
- 2.2.3 The bolts holding the counterweights must be tight and locked
- 2.2.4 The operating arm pivot screws must be tight and locked.
- 2.2.5 The contact carrier pivot screws must be tight and locked.
- 2.2.6 All sets of stroke adjusting screws must have their lock-nuts tight and locked.
- 2.2.7 The return counter weights on the operating arms shall be of equal mass and in similar positions.
- 2.2.8 All moving parts shall be free in movement.
- 2.2.9 Vane air gaps in the laminated and permanent magnet circuits must be clean of paint, metal scale and dust.
- 2.2.10 Vane and spectacle carrier shall be tight on the shaft.
- 2.2.11 Vane must be central in the iron circuit and in the permanent magnet gaps.
- 2.2.12 All retaining dowels shall be in place.
- 2.2.13 Lock nuts on spectacle counterweight adjusting screws must be tight.
- 2.2.14 The flexes must not be stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame. AAR.6.5.1/E 1991
- 2.2.15 With the top plate level in both directions the contacts shall be not less than 75% light tight on compression. *(VERY SUBJECTIVE!)*
- 2.2.16 The metal holder of the silver carbon contacts must not be within 0.060" (1/16") of the contact surface. AAR.7.1.4/E3 1990
- 2.2.17 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.561:1951/94
- 2.2.18 The moving assembly must be able to move freely in either direction from the

	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	<i>RHB</i>

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

centre position.

2.1.19 With the top plate level in both directions the red spectacle shall be dead central in the aperture with each roller clear of its respective operating arm.

2.1.20 The iron circuit fixing screw holes must be sealed.

2.2.21 The coils and magnetic circuit must be painted black.

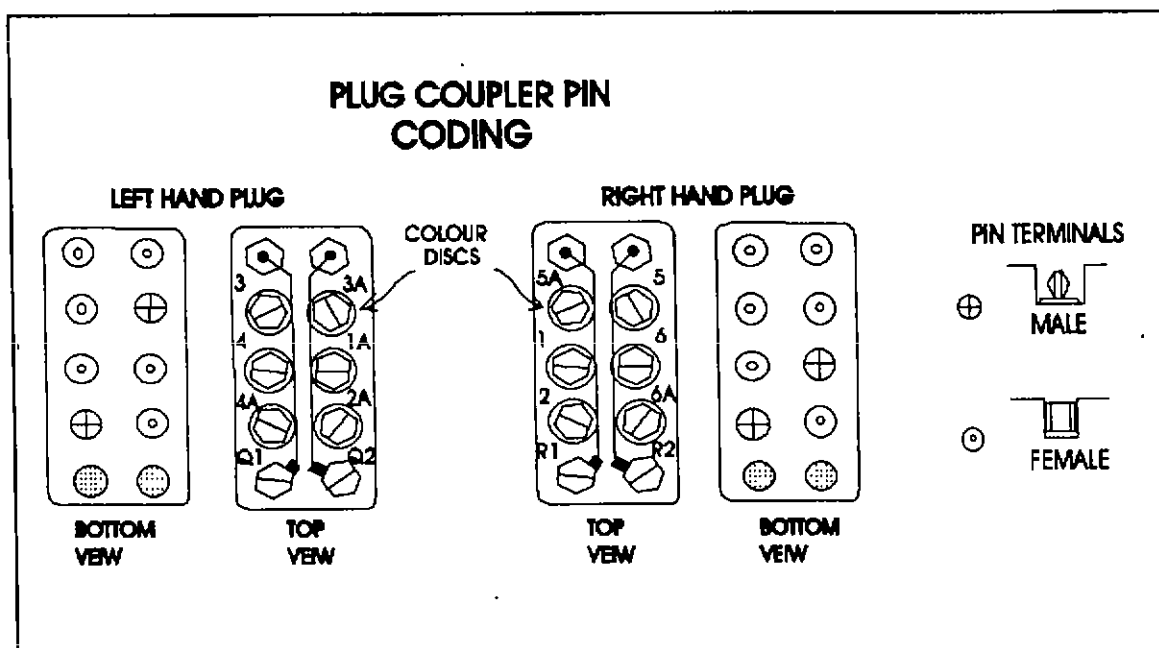
### **2.3 Plug Connectors**

2.3.1 The soldered joints to the connectors shall be correctly assembled.

2.3.2 The shape of terminal pin connectors shall be as indicated in figure 3, and contacting areas clean.


2.3.3 All coloured terminal pin discs shall be correct and marked for spectacle arrangements, see clause 3.2.

2.3.4 The plug coding shall be as per diagram:



Plug Coding (figure 3).



	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	<i>QAB</i>

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

#### **3. Mechanical Settings**

Unless otherwise specified, all performance tests shall be conducted for both yellow and green aspects of the relay.

3.1 Contacts shall be adjusted such that they do not make until the colour of the roundel matching the contact is evident, and the adjacent roundel has disappeared completely from view.

3.2 The following contacts shall make when their corresponding aspect colour is displayed:-

- |      |               |             |
|------|---------------|-------------|
| i.   | <b>Red</b>    | 1-1A & 2-2A |
| ii.  | <b>Yellow</b> | 3-3A & 4-4A |
| iii. | <b>Green</b>  | 5-5A & 6-6A |

3.3 The front contacts opening shall be not less than 0.050" when the neutral contacts just make. AAR.7.1.4/E9 1990

3.4 The neutral contacts opening shall be not less than 0.020" when the front contacts just make. AAR.6.5.1/F9 1991

3.5 Operating Arm/Contact Carrier and Vane bearings shall be not less than 0.002" and not greater than 0.008" larger than the pivots. BS.561:1951/7 and AAR.6.1.35/D3 1991

3.6 Vane end play shall be between 0.004" and 0.012". AAR.7.1.4/D13 1990

3.7 Vane to Laminations clearance shall be not less than 0.015". WB&S Letter. 9/6/1994

3.8 Vane to Permanent Magnet poles clearance shall be not less than 0.028". WB&S Letter. 9/6/1994


3.9 Contact Carrier end play shall be between 0.010" and 0.020" BS.561.1957/7

3.10 The Contact resistance shall not exceed :-

- |     |   |                   |
|-----|---|-------------------|
| i.  | Silver - Silver carbon :- 0.180 ohms - Front (Green & Yellow) Contacts. | AAR.7.1.4/E5 1990 |
| ii. | Silver - Silver :- 0.030 ohms - Neutral (Red) Contacts.                 | AAR.7.1.4/E6 1990 |

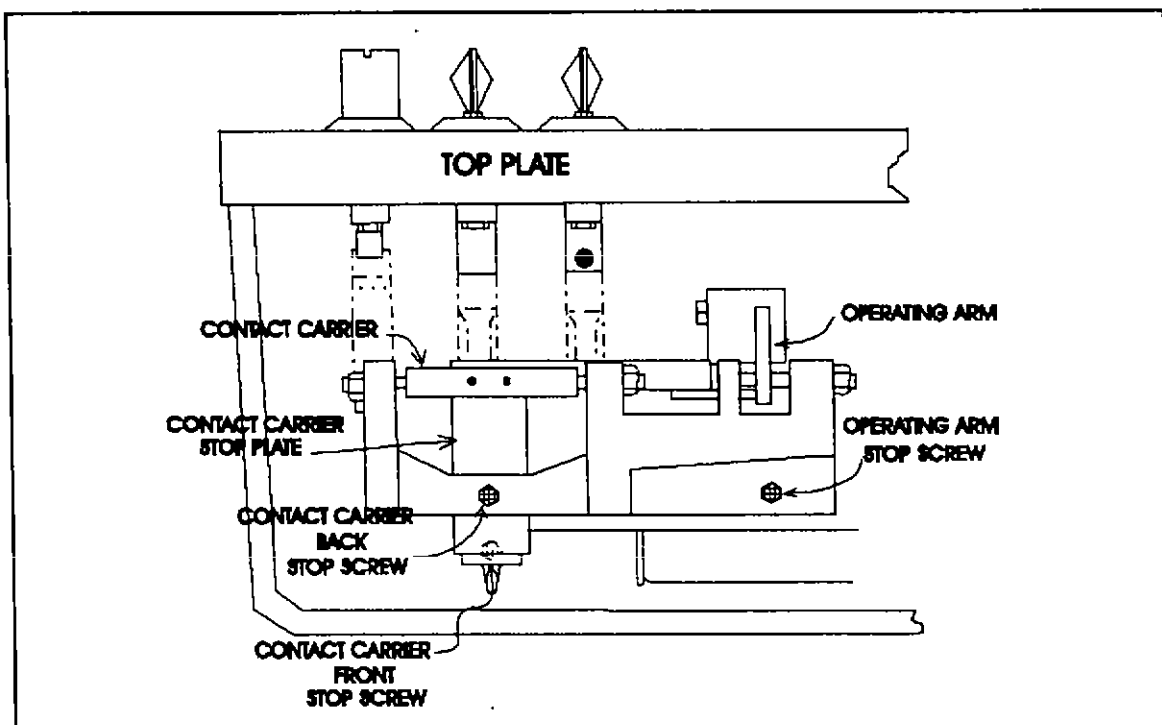
Contact resistance shall be checked with plug couplers in place.

3.11 Minimum Contact Pressure:- Green & Yellow 21gms.  
Red 14gms. WB&S Spec.18611.1940/pg20

	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

- 3.12 The left and right hand contact operating arms with counterweight attached, shall lift off their respective stops when a 50gm force is applied to the operating arm at its roller pivot.  
WB&S Spec.18611.1940/pg16-17
- 3.13 With spectacle dead centre, the operating arms shall clear the vane operating roller by 0.007".
- 3.14 With the red contacts adjusted to contact pressure there shall be a gap between the contact carrier stop plate and contact carrier back stop screw of 0.005".  
WB&S Spec. 18611.1940/pg16
- 3.15 When the vane is moved to vane buffer spring stop and just touches, there shall be a gap between the contact carrier stop plate and front stop screw of 0.005".  
WB&S Spec. 18611.1940/pg16



Mechanism Side View (figure 4).

	<b>Acceptance Specification</b>	RS SC 030107-01
	<b>Railway Signal Relay</b>	<i>RHS</i>

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

#### **4. TESTS**

##### **4.1 Operating Figures :-**

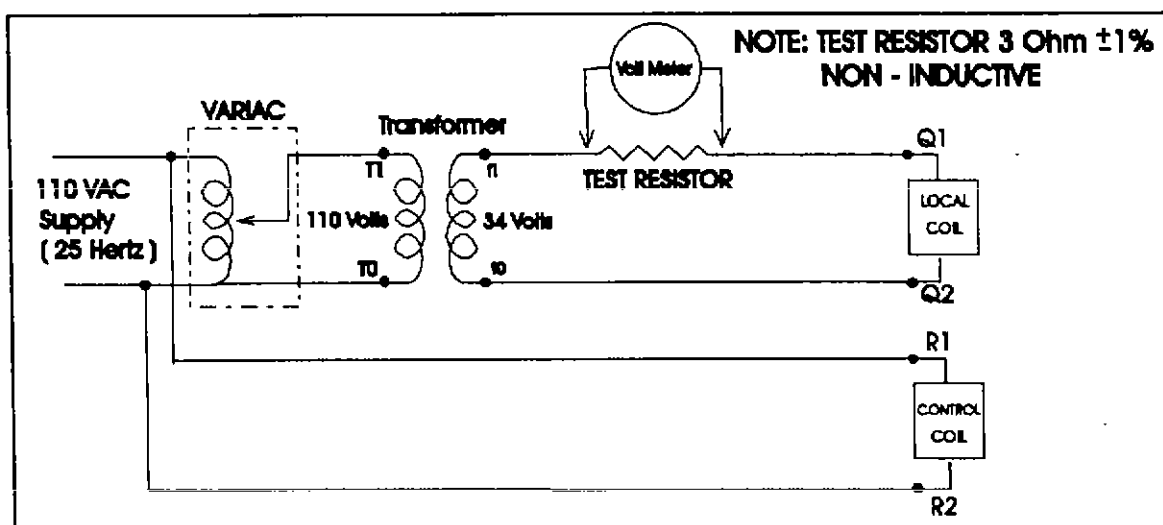
**Rated Voltage:-**      Control: 110 volt.  
                                  Local - see clause 4.7

**4.2** Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

The difference between operating figures for the Green and Yellow aspects shall be no more than 10% for all tests.

**4.3** The tests shall be performed with the relay complete, fitted with plug connectors and with the relay top plate level in both directions.

**4.4** The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document utilising the test circuit configuration below.



Circuit Diagram (figure 5).

**4.5** The transformer terminal markings shall be determined thus:  
 A current flowing through the primary coil, with terminal T1 positive with respect to T0 shall induce a voltage in the secondary winding such that t1 is positive with respect to t0 .

**4.6** Unless otherwise specified, all performance tests shall be conducted for both yellow and green aspects of the relay.

	<b>Acceptance Specification</b>	RS SC 030107-01
	<b>Railway Signal Relay</b>	<i>RS</i>

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

- 4.7 Unless otherwise specified, tests shall be conducted with the local coil energised to give 5.7V AC ( $\pm 1\%$ ) across the test resistor (see circuit diagram).

Note: This achieves Rated Voltage conditions for the local coil. PTC MI SC 0301-15

The voltages applied to both elements shall be kept substantially in phase or in antiphase. BS.561:1951/20

- 4.8 As the control voltage is reduced from compression, the voltage at which all neutral contacts just close shall be both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage. BS.561:1951/20

4.9 **Polarity Test:**

When AC voltage at rated voltage is applied to control and local coils such that R1 - R2 and Q1 - Q2 are simultaneously energised at the **same polarity**, the vane shall operate to indicate a **green aspect**.

When the rated voltage is applied to local and control coils such that R1 - R2 and Q1 - Q2 are simultaneously energised at the **opposite polarity** the vane shall operate to indicate a **yellow aspect**.

Absence of energy on control coil R1 - R2 or local coil Q1 - Q2 shall produce a **red aspect**.

AAR.7.1.4./D10 1990

- 4.10 **Test for Balancing:** By observation, the relay shall have positive pick-up and drop-away in both directions without hesitation and/or restriction with the rated voltage applied.

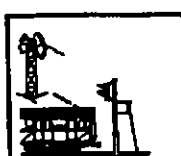
- 4.11 **Friction Test:** With rated voltages applied to both control and local coils, and the voltage on the local coil maintained, and the control voltage slowly reduced, the voltage on the control coil at which the last contact breaks shall be not less than 75% of the control voltage required to cause the first front contact to make.

BS.561:1951/20

- 4.12 The neutral contacts shall not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

- 4.13 **Reduced Voltage Performance:-** With the voltage on the control coil reduced to 93.5V and the voltage across the test resistor reduced to 4.8V (85% of rated voltages) the relay shall achieve full compression of its front contacts when energised under these conditions.

AAR.6.1.34/J5 1991

	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

#### **5. Shipping.**

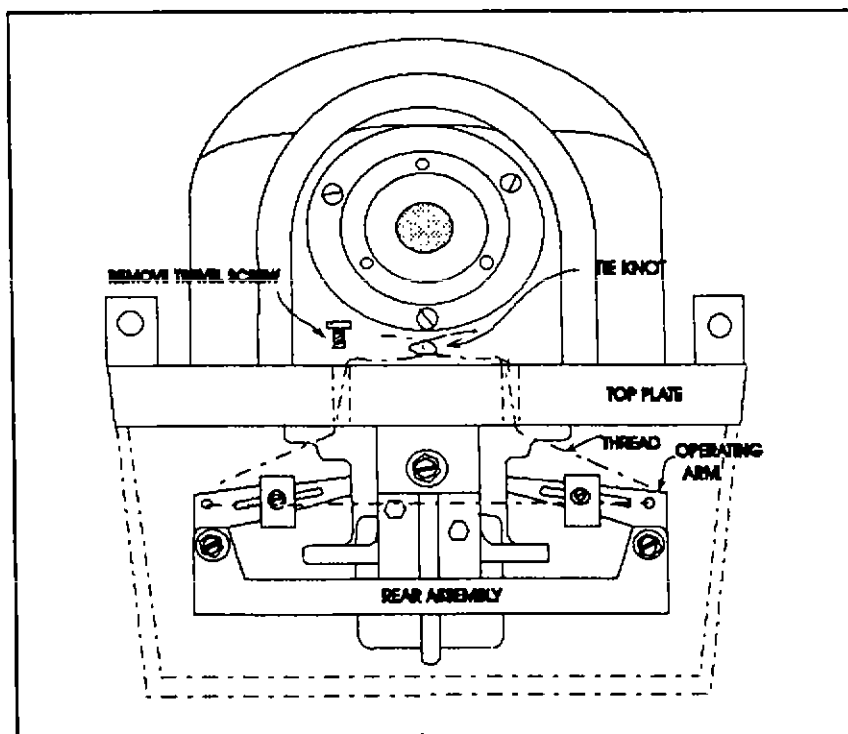
- 5.1 Relays shall be identified by manufacturer's serial number and Corporation number. Both shall be recorded on a Relay Record Card which shall be attached to the relay.
- 5.2 The relay mechanism shall be protected in transit using the following method:
  - i. Remove the travel screws.
  - ii. Check that the screw holes and their surrounds are clear of blockages and burrs.
  - iii. Manoeuvre thread (GS SC 020102 - 01) as shown in the diagram via the screw holes and mechanism, tying the ends firmly on the top plate. The thread, when double knotted, shall be sufficiently tight to stop excessive movement of the operating arms.
  - iv. Seal the travel screw holes with PVC insulation tape.
  - v. Place the travel screws in a sealed envelope marked:

#### **"ATTENTION"**

**Cut and remove cord.**

**Fit travel screws before use.**

- vi. Using a suitable string, attach the envelope to the carry handle.



**Searchlight Mechanism (Rear View)**

	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	

### **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

#### **6. Procedure Information.**

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open. BS.561:1951/20b

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage. BS.561:1951/13

##### **6.5 Bob-Test**

With 85% of rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

BS.561:1951/9a

##### **6.6 Full Colour**

With 85% of rated voltages applied to the local and control coils of the relay, full colour of yellow and/or green viewed from the rear of the relay at any position shall appear in the aperture, the colour shall maintain complete visibility as the voltages are increased to rated voltage. AAR.7.1.4/ES 1990

	<b>Acceptance Specification</b>	<b>RS SC 030107-01</b>
	<b>Railway Signal Relay</b>	

## **V3G 2-2-2 (C5) 25Hz AC Searchlight Relay**

### **7. Definitions.**

#### **7.1 Contact Types**

7.1.1 Green contact: that pair of contact components which close when a searchlight signal relay is so energised that both local and control element terminal having the same polarity markings are of the same polarity at any instant. The signal shall display a green aspect.

7.1.2 Yellow contact: that pair of contact components which close when a searchlight signal relay is so energised that both local and control element terminal having same polarity markings are of opposite polarity at any instant. The signal shall display a yellow aspect.

7.1.3 Red or Neutral contact: that pair of contact components which close when a searchlight signal relay is de-energised. The signal shall display a red aspect.

#### **7.2 Contact Compression**

The point at which all closed contacts reach the specified minimum contact pressure.

#### **7.3 Contact Wipe**

The distance a moving contact travels along the fixed contact during its closing movement from the point at which it touches the fixed contact to its final compressed position.

7.4 **Pick Up Voltage:** That value of volts applied to the relay which will just cause all green or yellow contacts to make electrical contact. BS.561:1951/20

7.5 **Compression Voltage:** Shall be the value of volts applied to the relay which will compress the green or yellow contacts to the amount specified.

7.6 **Rated Voltage:** That nominal value of volts intended to be applied to the relay in service operation. BS.561:1951/2a

7.7 **Drop Away Voltage:** The value at which all green or yellow contacts just open as the voltage is gradually decreased from the rated voltage. BS.561:1951/20



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## Acceptance Specification

RS SC 030107-02

### Railway Signal Relay

#### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

This document details the minimum acceptance performance requirements following rehabilitation of a Westinghouse Brake & Signal V3G 2-2-2 (C5) 50Hz Railway Searchlight Signal Relay.

#### **1. Insulation Resistance.**

- 1.1 Withstand Pressure Test between all circuits and contacts to "frame" and between insulated circuits at 2000 volts AC (r.m.s.) 50Hz for 1(one) minute.

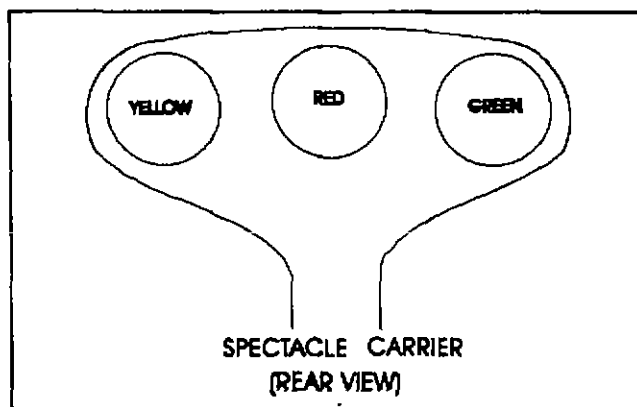
BS.581:1951/19b

The insulation resistance (following this test) between any circuit or contact and frame, and between one circuit contact and all others shall be not less than 1 megohm when tested at 500 volts DC.

#### **2. Mechanical Inspection.**


##### **2.1 Case**

- 2.1.1 The roundel glasses must be clean and intact.
- 2.1.2 The roundel case must be properly fixed to the top plate.
- 2.1.3 The carrying handle must be tight.
- 2.1.4 The gaskets must be intact, seal properly and be free from dust and moisture.
- 2.1.5 Relay cover must be clean, clear and undamaged. BS.581:1951/3a
- 2.1.6 Top plate plug contact terminal pins shall be to the desired shape (see top plate coding figure 2) and their surrounds shall be properly sealed.
- 2.1.7 The correct colour roundels must be fitted to the spectacle (see diagram).



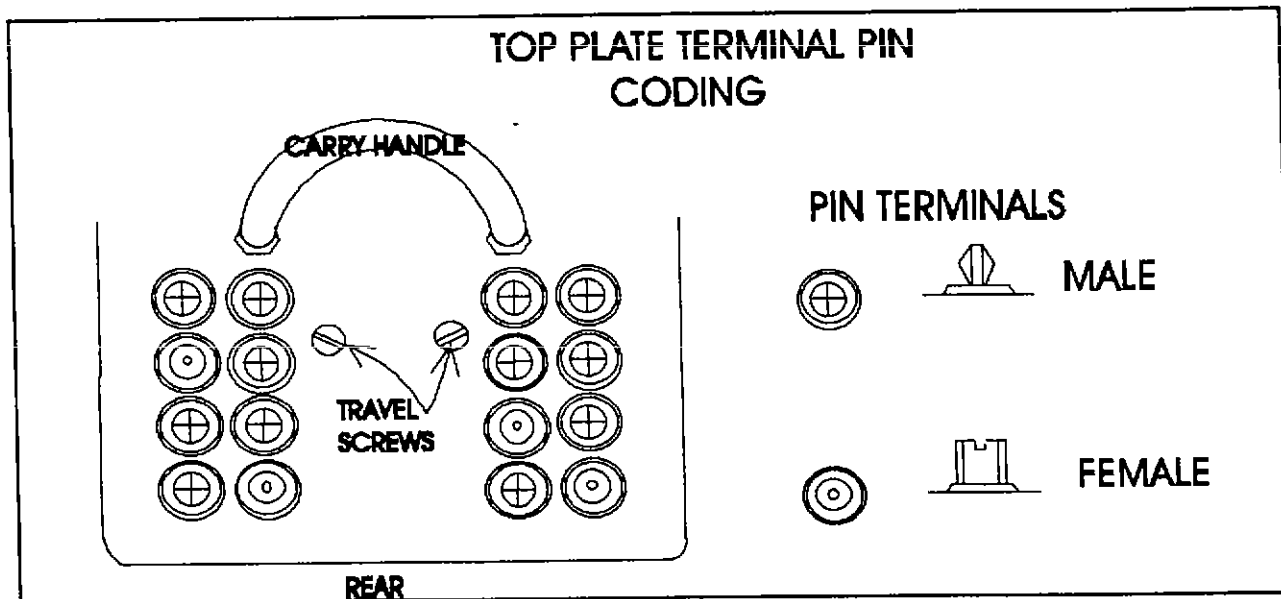
**Spectacle Arrangement (figure 1).**



	<b>Acceptance Specification</b>	<b>RS SC 030107-02</b>
	<b>Railway Signal Relay</b>	

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

- 2.1.8 All screws, nuts and terminals are tight and locking tabs must be intact and fitted correctly. AAR.6.4.5/B8 1991
- 2.1.9 There must be at least 0.125" clearance between all moving parts and fixed parts and/or cover unless otherwise specified. AAR.6.4.5/B9 1991



Top Plate Plug Coding (figure 2).

- 2.1.10 The correct terminal pin coding must be affixed to the top of the relay for each plug (see diagram).
- 2.1.11 The following labels shall be fitted and clearly visible.:
- i. Relay contact arrangement label 15B1150.
  - ii. The Corporation's identification label which shall have conforming performance figures & signature of tester.

AAR.6.4.5/B11 1991

	<b>Acceptance Specification</b>	<b>RS SC 030107-02</b>
	<b>Railway Signal Relay</b>	<i>RHB</i>

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

#### **2.2 Mechanism**

- 2.2.1 Pivots and bearings must be clean and dry.
- 2.2.2 Cylindrical pivots shall be no less than 0.055" or no more than 0.165" in diameter. AAR.6.1.35/D3 1991.
- 2.2.3 The bolts holding the counterweights must be tight and locked
- 2.2.4 The operating arm pivot screws must be tight and locked.
- 2.2.5 The contact carrier pivot screws must be tight and locked.
- 2.2.6 All sets of stroke adjusting screws must have their lock-nuts tight and locked.
- 2.2.7 The return counter weights on the operating arms shall be of equal mass and in similar positions.
- 2.2.8 All moving parts shall be free in movement.
- 2.2.9 Vane air gaps in the laminated and permanent magnet circuits must be clean of paint, metal scale and dust.
- 2.2.10 Vane and spectacle carrier shall be tight on the shaft.
- 2.2.11 Vane must be central in the iron circuit and in the permanent magnet gaps.
- 2.2.12 All retaining dowels shall be in place.
- 2.2.13 Lock nuts on spectacle counterweight adjusting screws must be tight.
- 2.2.14 The flexes must not be stiff and/or tight so as to restrict contact movement or loose enough to be able to short on any other conducting part or frame. AAR.6.5.1/E 1991
- 2.2.15 With the top plate level in both directions the contacts shall be not less than 75% light tight on compression. BS.561:1951/9d
- 2.2.16 The metal holder of the silver carbon contacts must not be within 0.060" (1/16") of the contact surface. AAR..7.1.4/E3 1990
- 2.2.17 The contact fingers shall meet the fixed contact surfaces uniformly and shall make a wiping contact over a distance of not less than 0.010" when the relay is energised at the rated voltage or when it is de-energised. BS.561:1951/9d
- 2.2.18 The moving assembly must be able to move freely in either direction from the centre position.

	Acceptance Specification	RS SC 030107-02
	Railway Signal Relay	<i>PhB</i>

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

2.1.19 With the top plate level in both directions the red spectacle shall be dead central in the aperture with each roller clear of its respective operating arm.

2.1.20 The iron circuit fixing screw holes must be sealed.

2.2.21 The coils and magnetic circuit must be painted yellow.

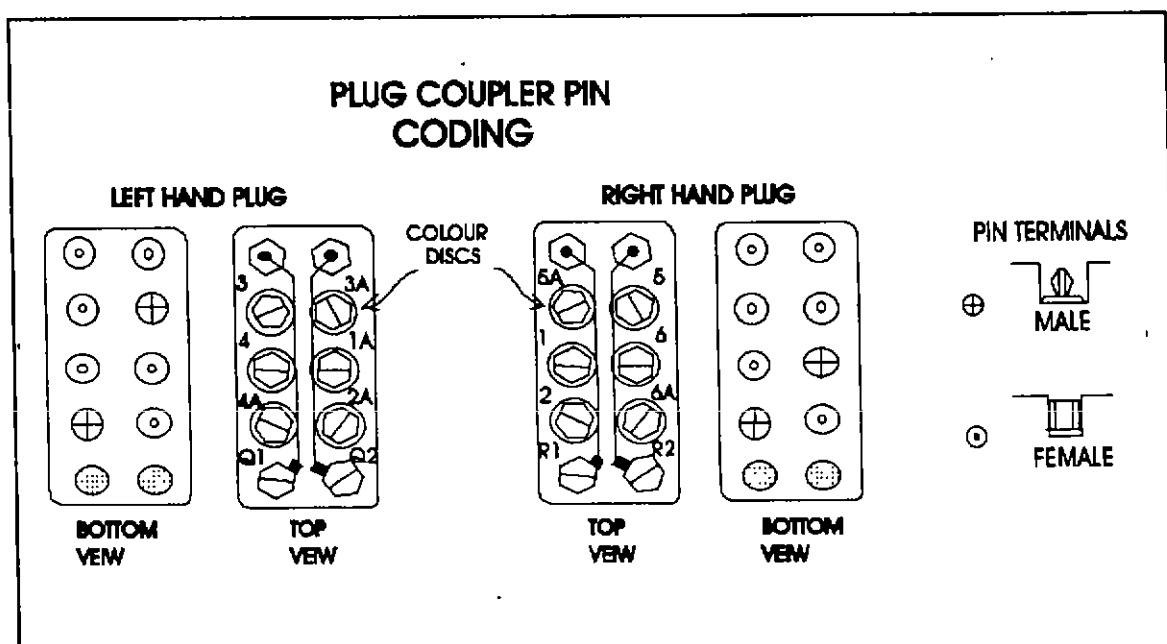
### **2.3 Plug Connectors**

2.3.1 The soldered joints to the connectors shall be correctly assembled.

2.3.2 The shape of terminal pin connectors shall be as indicated in figure 3, and contacting areas clean.

2.3.3 All coloured terminal pin discs shall be correct and marked for spectacle arrangements, see clause 3.2.

2.3.4 The plug coding shall be as per diagram:



Plug Coding (figure 3).

	<b>Acceptance Specification</b>	<b>RS SC 030107-02</b>
	<b>Railway Signal Relay</b>	<i>RHB</i>

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

#### **3. Mechanical Settings**

Unless otherwise specified, all performance tests shall be conducted for both yellow and green aspects of the relay.

3.1 Contacts shall be adjusted such that they do not make until the colour of the roundel matching the contact is evident, and the adjacent roundel has disappeared completely from view.

3.2 The following contacts shall make when their corresponding aspect colour is displayed:-

- |      |               |             |
|------|---------------|-------------|
| i.   | <b>Red</b>    | 1-1A & 2-2A |
| ii.  | <b>Yellow</b> | 3-3A & 4-4A |
| iii. | <b>Green</b>  | 5-5A & 6-6A |

3.3 The front contacts opening shall be not less than 0.050" when the neutral contacts just make. AAR.7.1.4/E9 1990

3.4 The neutral contacts opening shall be not less than 0.020" when the front contacts just make. AAR.6.5.1/F9 1991

3.5 Operating Arm/Contact Carrier and Vane bearings shall be not less than 0.002" and not greater than 0.008" larger than the pivots.

BS.561:1951/7 and AAR.6.1.35/D3 1991

3.6 Vane end play shall be between 0.004" and 0.012". AAR.7.1.4/D13 1990

3.7 Vane to Laminations clearance shall be not less than 0.015". WB&S Letter. 9/6/1994

3.8 Vane to Permanent Magnet poles clearance shall be not less than 0.028". WB&S Letter. 9/6/1994

3.9 Contact Carrier end play shall be between 0.010" and 0.020" BS.561.1957/7

3.10 The Contact resistance shall not exceed :-

- i. Silver - Silver carbon :- 0.180 ohms - Front (Green & Yellow) Contacts.

AAR.7.1.4/E5 1990

- ii. Silver - Silver :- 0.030 ohms - Neutral (Red) Contacts. AAR.7.1.4/E6 1990

Contact resistance shall be checked with plug couplers in place.

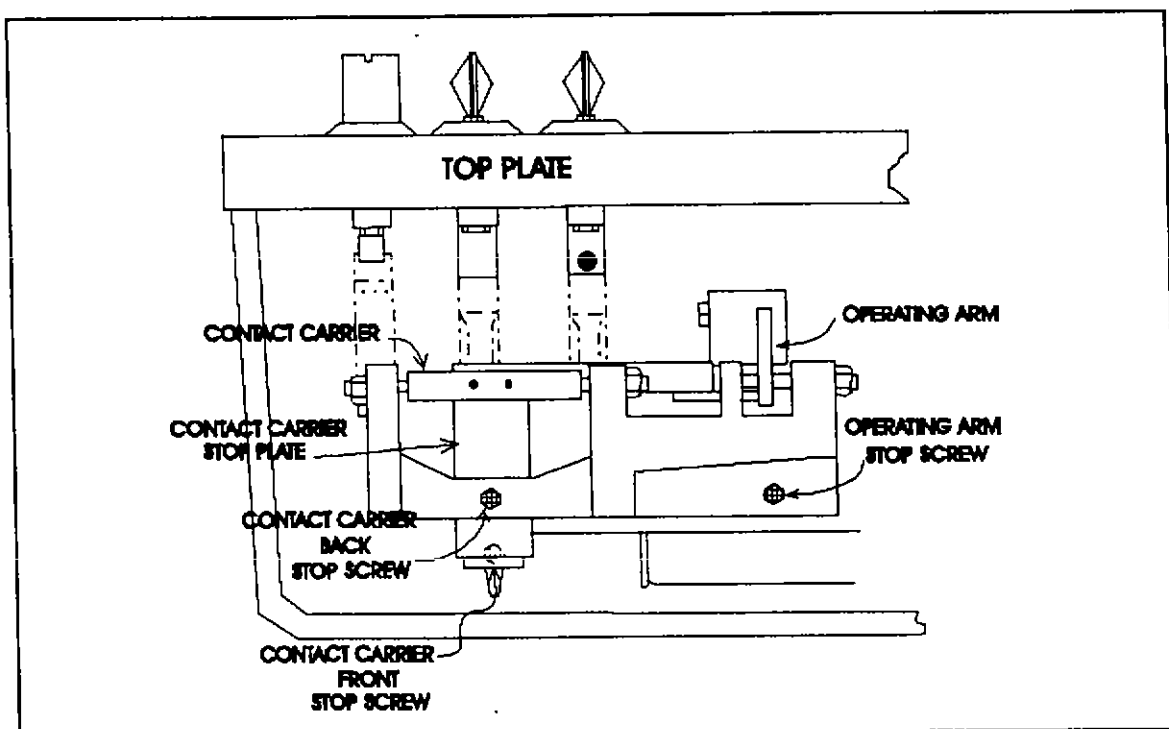
3.11 Minimum Contact Pressure:- Green & Yellow 21gms.  
Red 14gms.

WB&S Spec.18611.1940/pg20

	Acceptance Specification	RS SC 030107-02
	Railway Signal Relay	<i>RHB</i>

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

- 3.12 The left and right hand contact operating arms with counterweight attached, shall lift off their respective stops when a 50gm force is applied to the operating arm at its roller pivot.  
WB&S Spec. 18611.1940/pg16-17
- 3.13 With spectacle dead centre, the operating arms shall clear the vane operating roller by 0.007".
- 3.14 With the red contacts adjusted to contact pressure there shall be a gap between the contact carrier stop plate and contact carrier back stop screw of 0.005".  
WB&S Spec. 18611.1940/pg16
- 3.15 When the vane is moved to vane buffer spring stop and just touches, there shall be a gap between the contact carrier stop plate and front stop screw of 0.005".  
WB&S Spec. 18611.1940/pg16



Mechanism Side View (figure 4).

	<b>Acceptance Specification</b>	RS SC 030107-02
	<b>Railway Signal Relay</b>	<i>RHB</i>

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

#### **4. TESTS**

##### **4.1 Operating Figures :-**

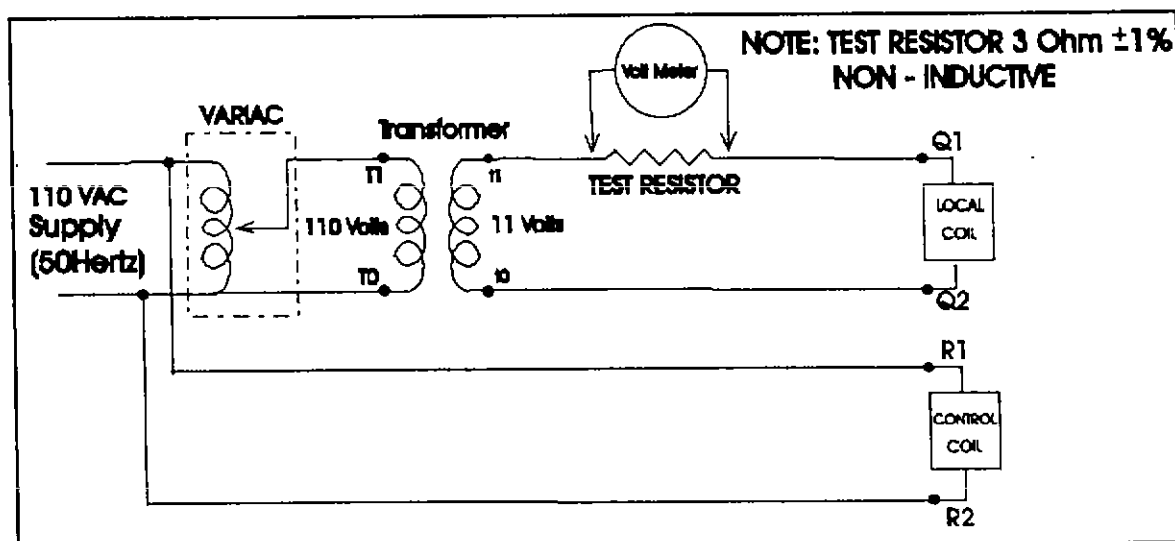
**Rated Voltage:-** Control: 110 volt.  
Local - see clause 4.7

4.2 Unless otherwise specified, a tolerance of  $\pm 5\%$  from expected figures will be accepted.

The difference between operating figures for the Green and Yellow aspects shall be no more than 10% for all tests.

4.3 The tests shall be performed with the relay complete, fitted with plug connectors and with the relay top plate level in both directions.

4.4 The tests shall be performed in accordance with clauses 6.1, 6.2 & 6.3 of this document utilising the test circuit configuration below.



Circuit Diagram (figure 5).

- 4.5 The transformer terminal markings shall be determined thus:  
A current flowing through the primary coil, with terminal T1 positive with respect to T0 shall induce a voltage in the secondary winding such that t1 is positive with respect to t0 .
- 4.6 Unless otherwise specified, all performance tests shall be conducted for both yellow and green aspects of the relay.

	<b>Acceptance Specification</b>	RS SC 030107-02
	<b>Railway Signal Relay</b>	<i>LAB</i>

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

- 4.7 Unless otherwise specified, tests shall be conducted with the local coil energised to give 5.7V AC ( $\pm 1\%$ ) across the test resistor (see circuit diagram).

Note: This achieves Rated Voltage conditions for the local coil. PTC MI SC 0301-15

The voltages applied to both elements shall be kept substantially in phase or in antiphase.

BS.561:1951/20

- 4.8 As the control voltage is reduced from compression, the voltage at which all neutral contacts just close shall be both, not less than 50% of the pick up voltage and not less than 30% of the rated voltage.

BS.561:1951/20

4.9 **Polarity Test:**

When AC voltage at rated voltage is applied to control and local coils such that R1 - R2 and Q1 - Q2 are simultaneously energised at the **same polarity**, the vane shall operate to indicate a **green aspect**.

When the rated voltage is applied to local and control coils such that R1 - R2 and Q1 - Q2 are simultaneously energised at the **opposite polarity** the vane shall operate to indicate a **yellow aspect**.

Absence of energy on control coil R1 - R2 or local coil Q1 - Q2 shall produce a **red aspect**.

AAR.7.1.4./D10 1990

- 4.10 **Test for Balancing:** By observation, the relay shall have positive pick-up and drop-away in both directions without hesitation and/or restriction with the rated voltage applied.

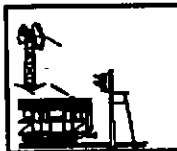
- 4.11 **Friction Test:** With rated voltages applied to both control and local coils, and the voltage on the local coil maintained, and the control voltage slowly reduced, the voltage on the control coil at which the last contact breaks shall be not less than 75% of the control voltage required to cause the first front contact to make.

BS.561:1951/20

- 4.12 The neutral contacts shall not "bounce" open when the relay drops as per the Bob-Test clause 6.5.

- 4.13 **Reduced Voltage Performance:-** With the voltage on the control coil reduced to 93.5V and the voltage across the test resistor reduced to 4.8V (85% of rated Voltages) the relay shall achieve full compression of its front contacts when energised under these conditions.

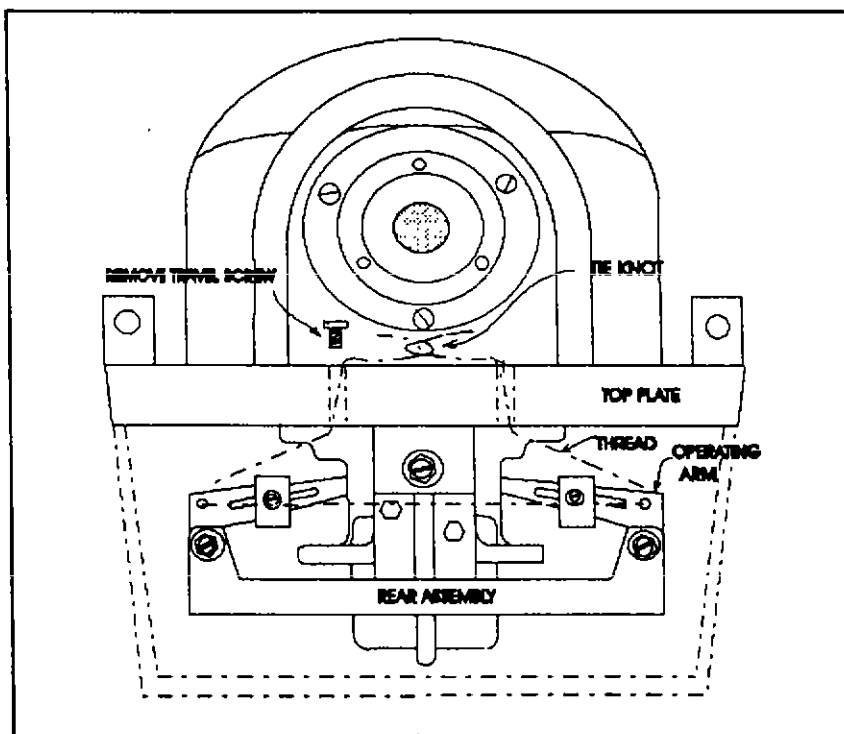
AAR.6.1.34/J5 1991

**V3G 2-2-2 (C5) 50Hz AC Searchlight Relay****5. Shipping.**


- 5.1 Relays shall be identified by manufacturer's serial number and Corporation number. Both shall be recorded on a Relay Record Card which shall be attached to the relay.
- 5.2 The relay mechanism shall be protected in transit using the following method:
- Remove the travel screws.
  - Check that the screw holes and their surrounds are clear of blockages and burrs.
  - Manoeuvre thread (GS SC 020102 - 01) as shown in the diagram via the screw holes and mechanism, tying the ends firmly on the top plate. The thread, when double knotted, shall be sufficiently tight to stop excessive movement of the operating arms.
  - Seal the travel screw holes with PVC insulation tape.
  - Place the travel screws in a sealed envelope marked:

**"ATTENTION"****Cut and remove cord.****Fit travel screws before use.**

- Using a suitable string, attach the envelope to the carry handle.

**Searchlight Mechanism (Rear View)**



	<b>Acceptance Specification</b>	RS SC 030107-02
	<b>Railway Signal Relay</b>	<i>RHB</i>

### **V3G 2-2-2 (C5) 50Hz AC Searchlight Relay**

#### **6. Procedure Information.**

##### **6.1 Pick Up Test**

Gradually increase the voltage on the control coil until all front contacts just close.

##### **6.2 Compression Test**

After "pick up" continue to gradually increase the voltage on the control coil until the front contacts reach compression.

##### **6.3 Drop Away Test**

Increase the applied voltage on the control coil to 125% rated value then gradually reduce the voltage until all the front contacts open. BS.561:1951/206

##### **6.4 Contact Pressures**

Measured when relay energised by a sudden application of not more than the compression voltage. BS.561:1951/13

##### **6.5 Bob-Test**

With 85% of rated voltage applied to the local, and with 75% and then 125% of the rated control voltage applied, the contacts shall not bounce open at the end of vane travel when the control switch is opened or closed.

BS.561:1951/9a

##### **6.6 Full Colour**

With 85% of rated voltages applied to the local and control coils of the relay, full colour of yellow and/or green viewed from the rear of the relay at any position shall appear in the aperture, the colour shall maintain complete visibility as the voltages are increased to rated voltage.

AAR.7.1.4/E8 1990